



APPLN. NO.: 09/699,873
TITLE: MICROFABRICATED
CHEMICAL REACTOR

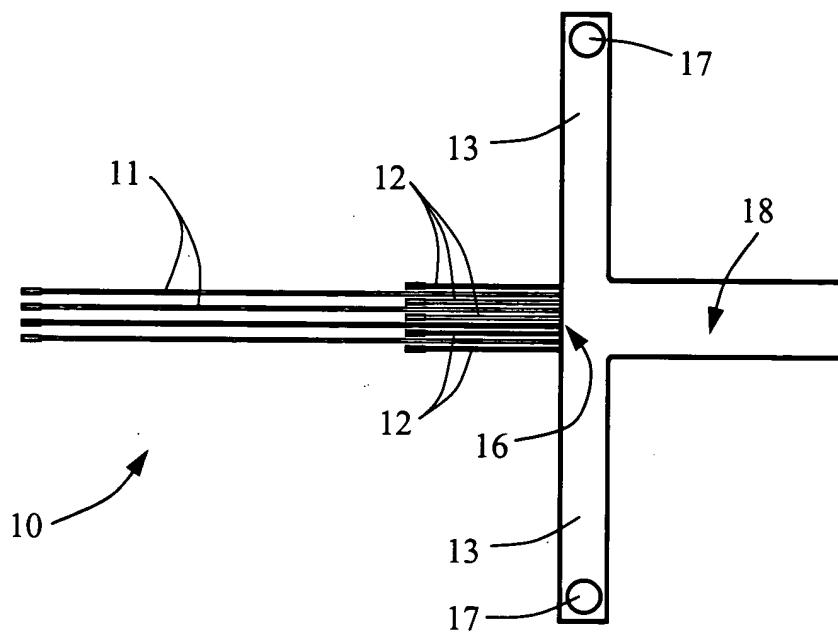


FIGURE 1

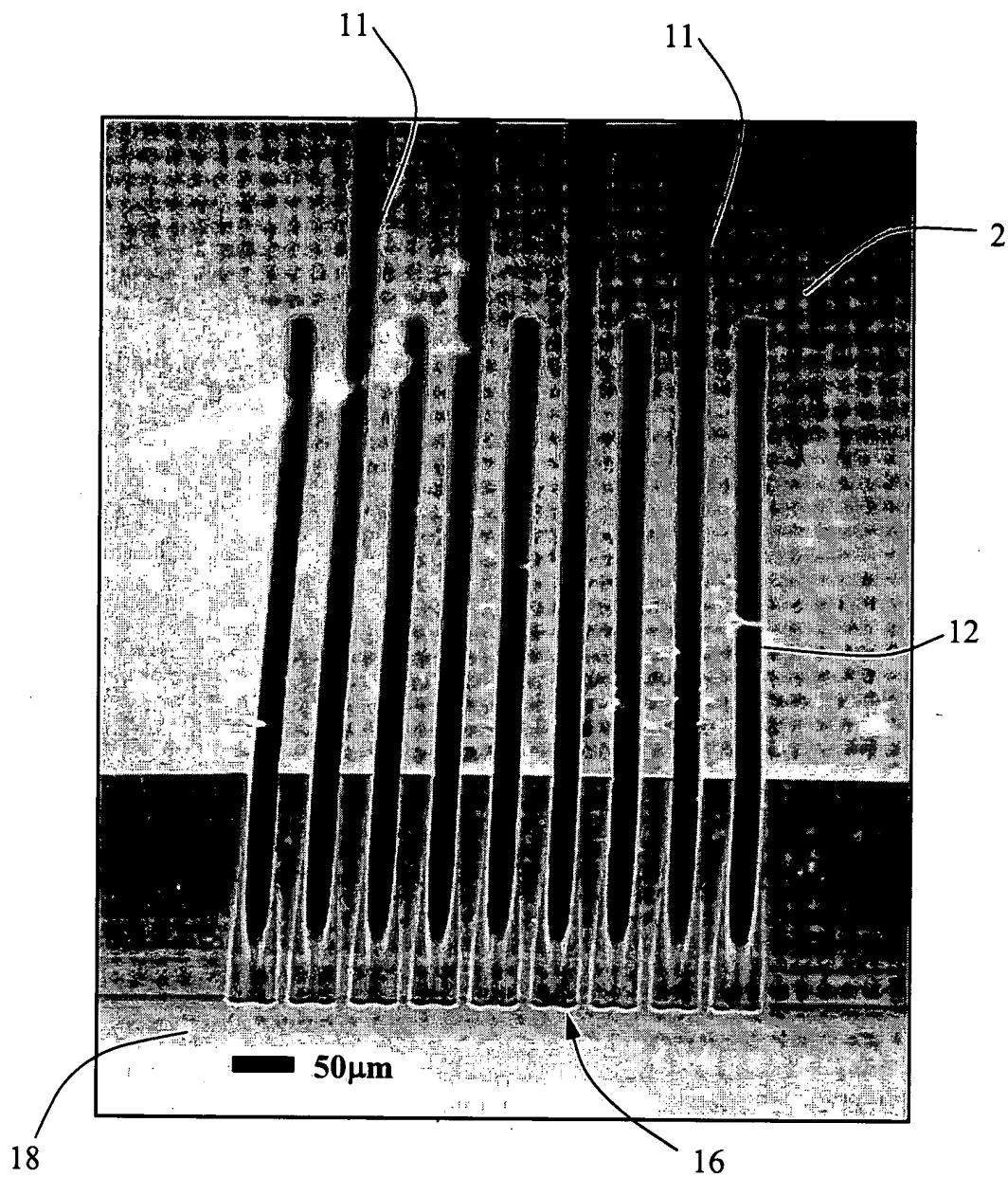


FIGURE 2

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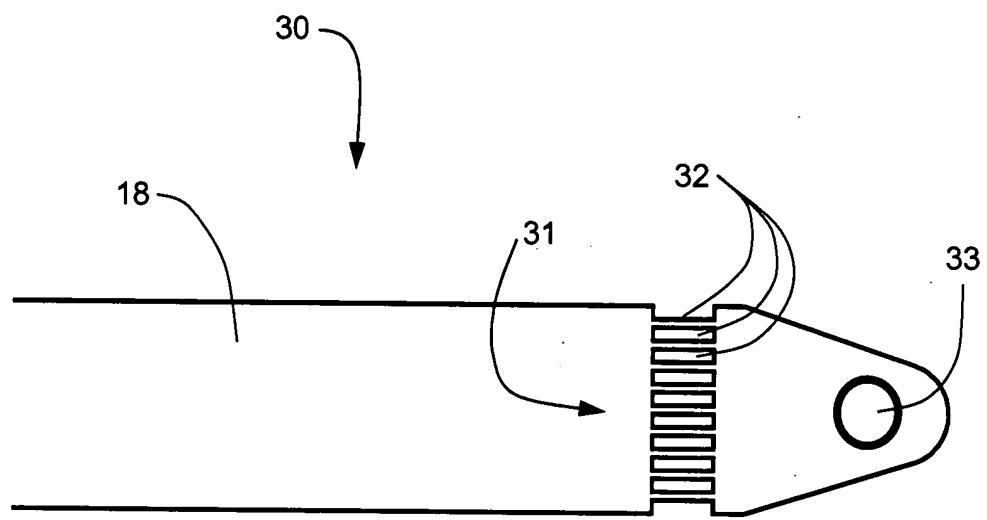


FIGURE 3

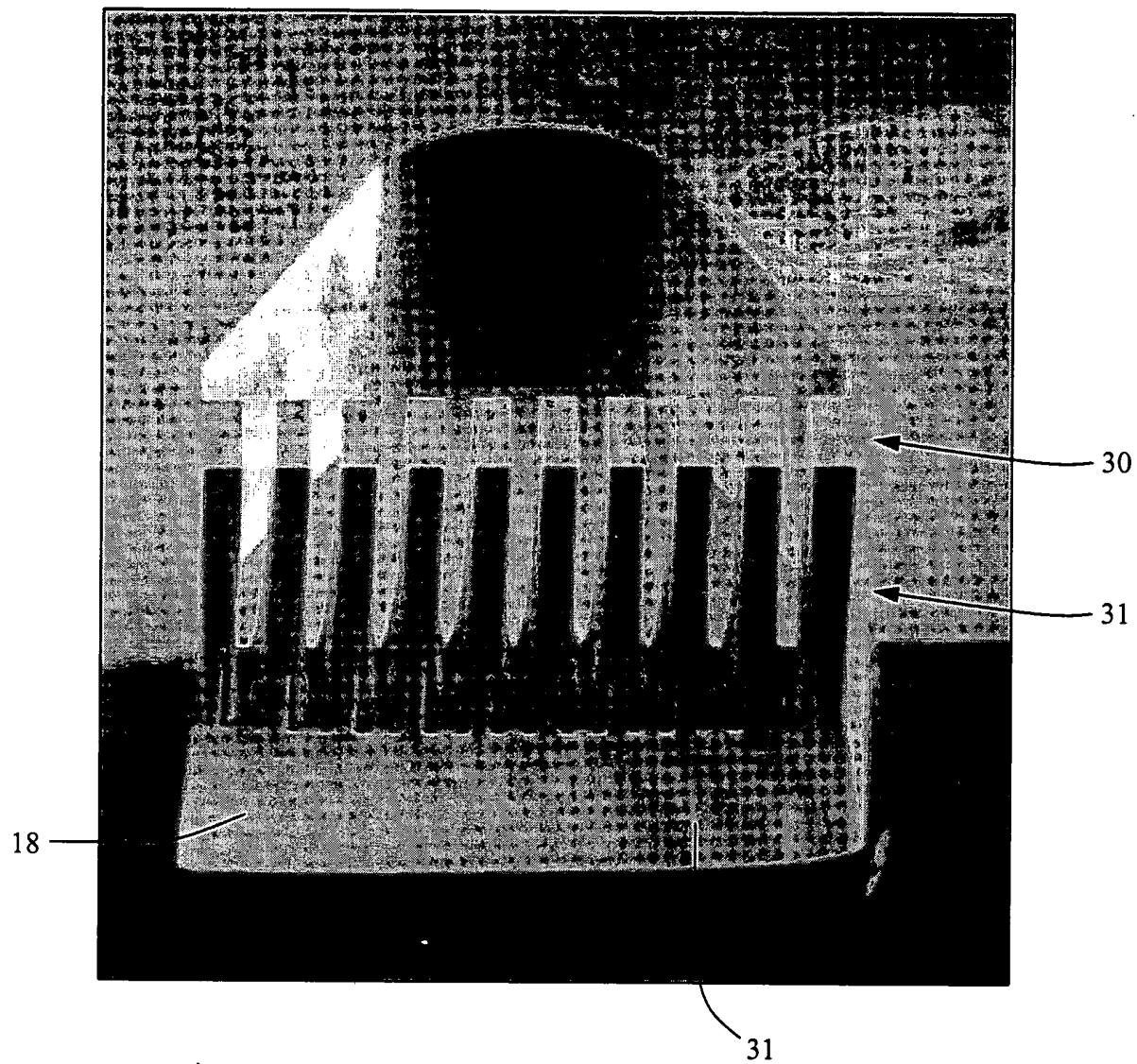


FIGURE 4

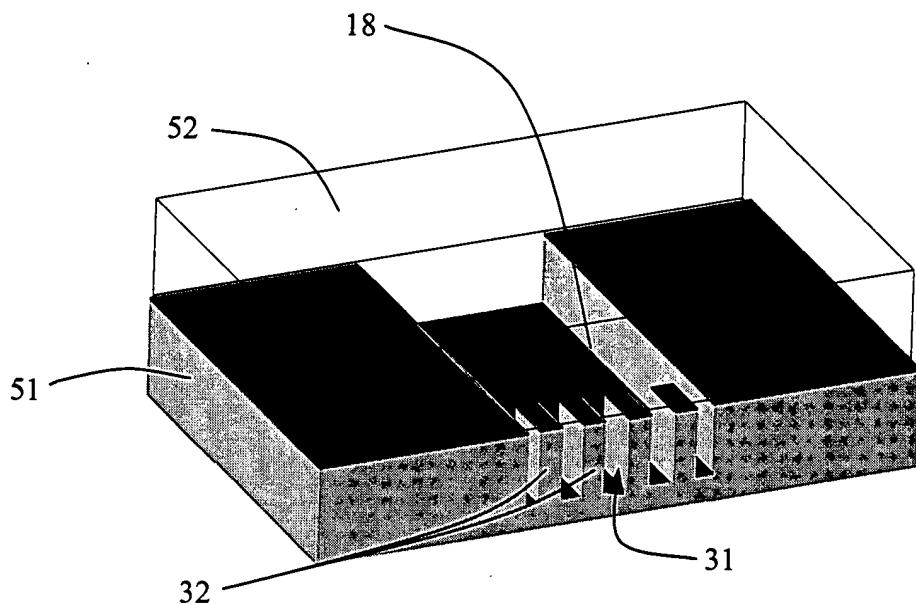


FIGURE 5

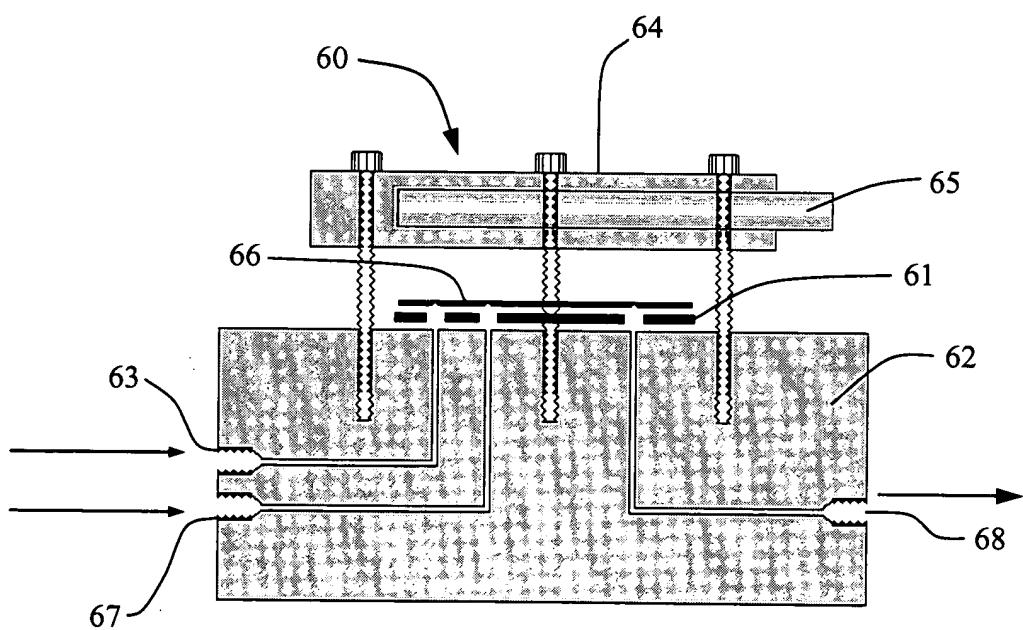


FIGURE 6

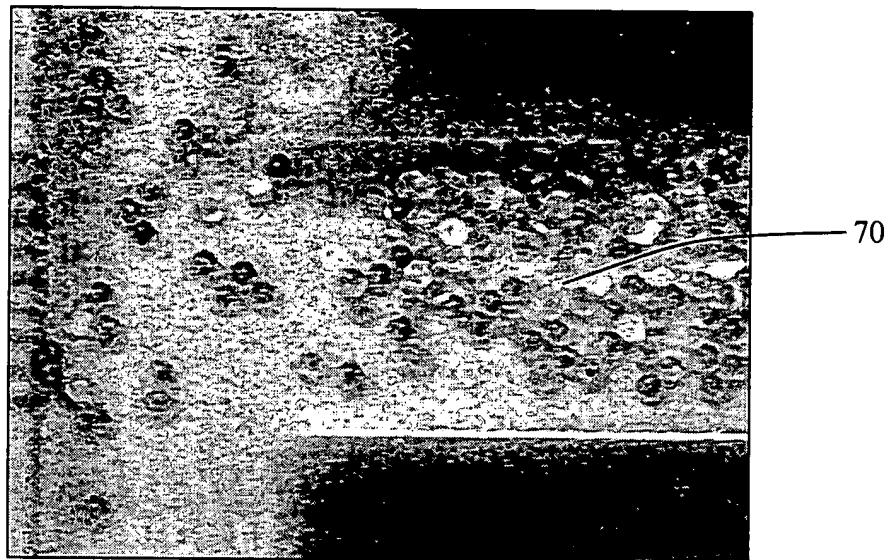


FIGURE 7a

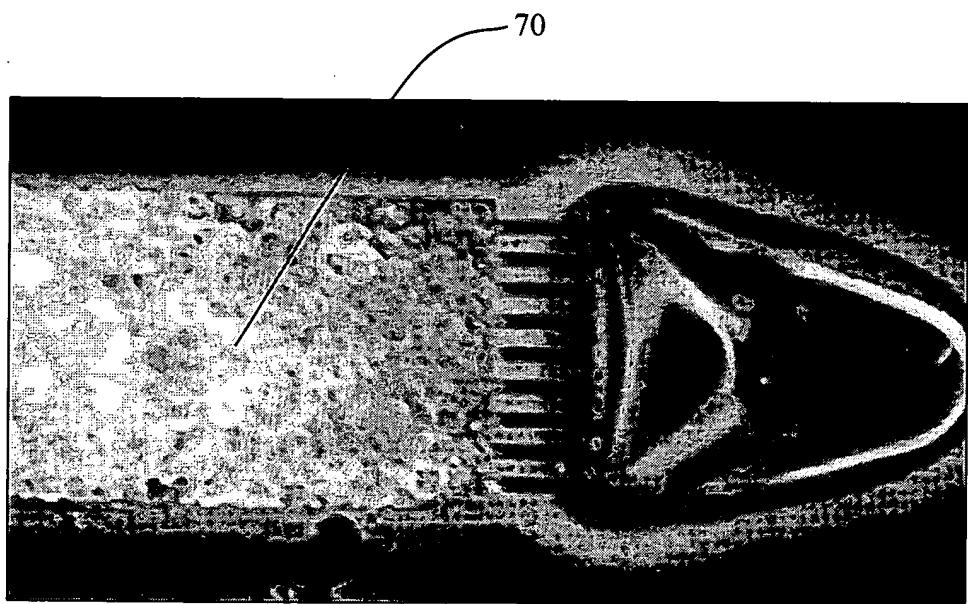


FIGURE 7b

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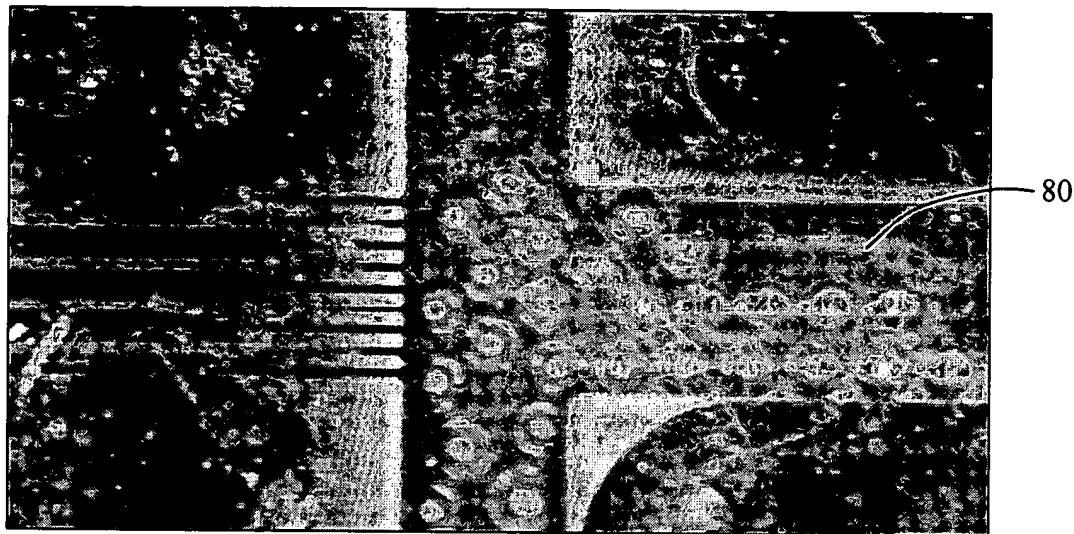


FIGURE 8

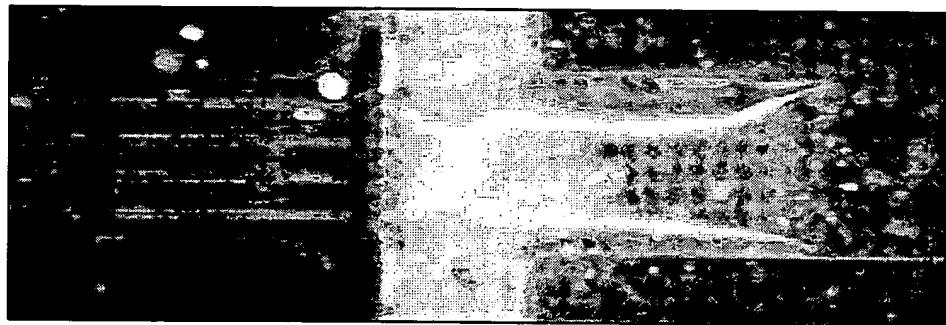


FIGURE 9

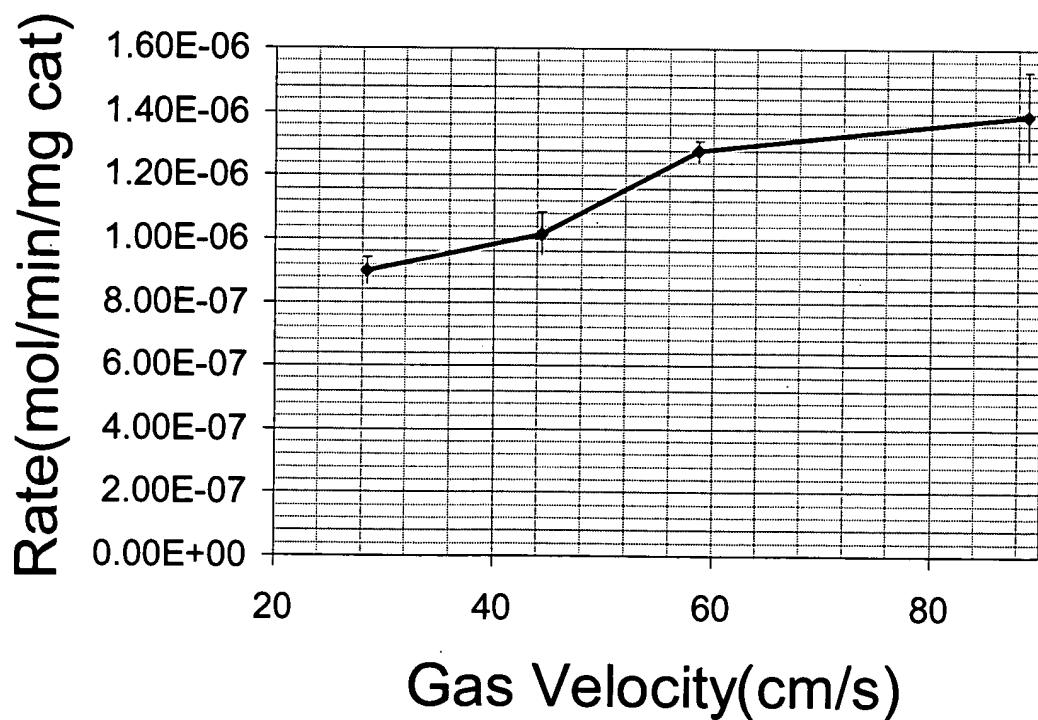
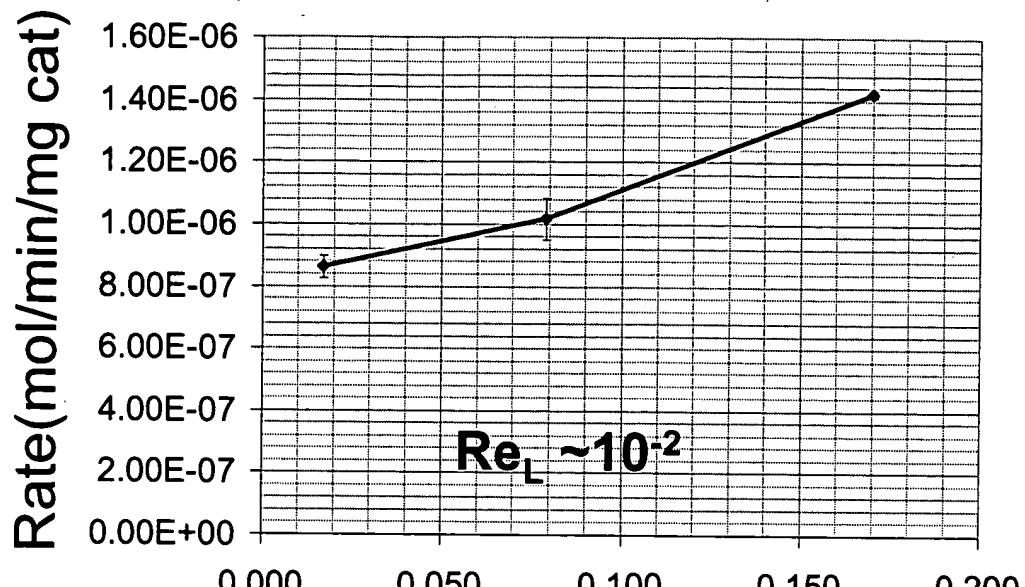


FIGURE 10a

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$$k_L a = 0.45 * \frac{D_{AL}}{d_p^2} [Re_L^{4/5} \cdot We_L^{1/5} \cdot Sc_L^{1/2} \cdot X_G^{1/2} \cdot \alpha]^{1/3}$$

FIGURE 10b

$$k_L a = 0.12 \cdot E_I^{1/2}$$
$$E_I^{1/2} = \frac{\Delta P}{\Delta L} \cdot v_L$$

FIGURE 10c

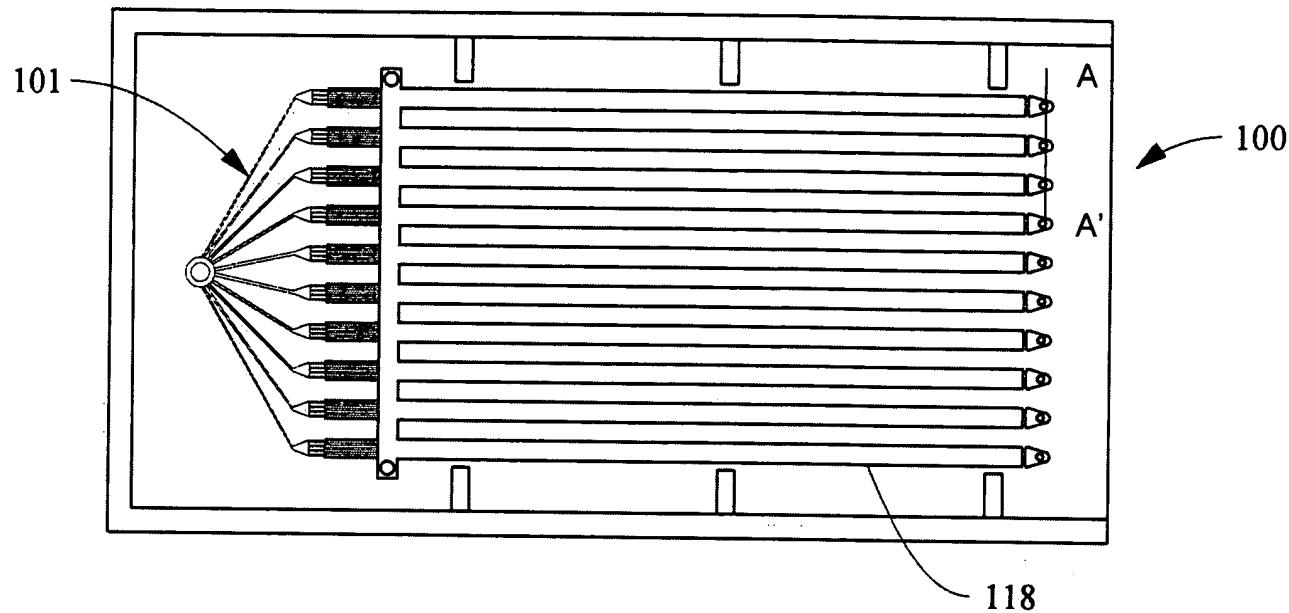


FIGURE 11a

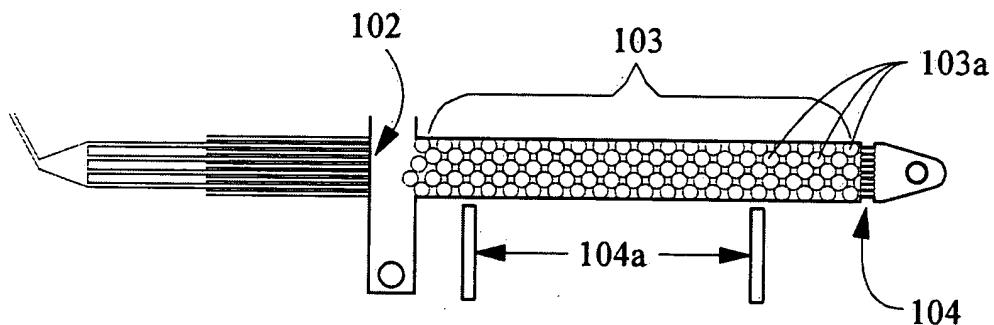


FIGURE 11b

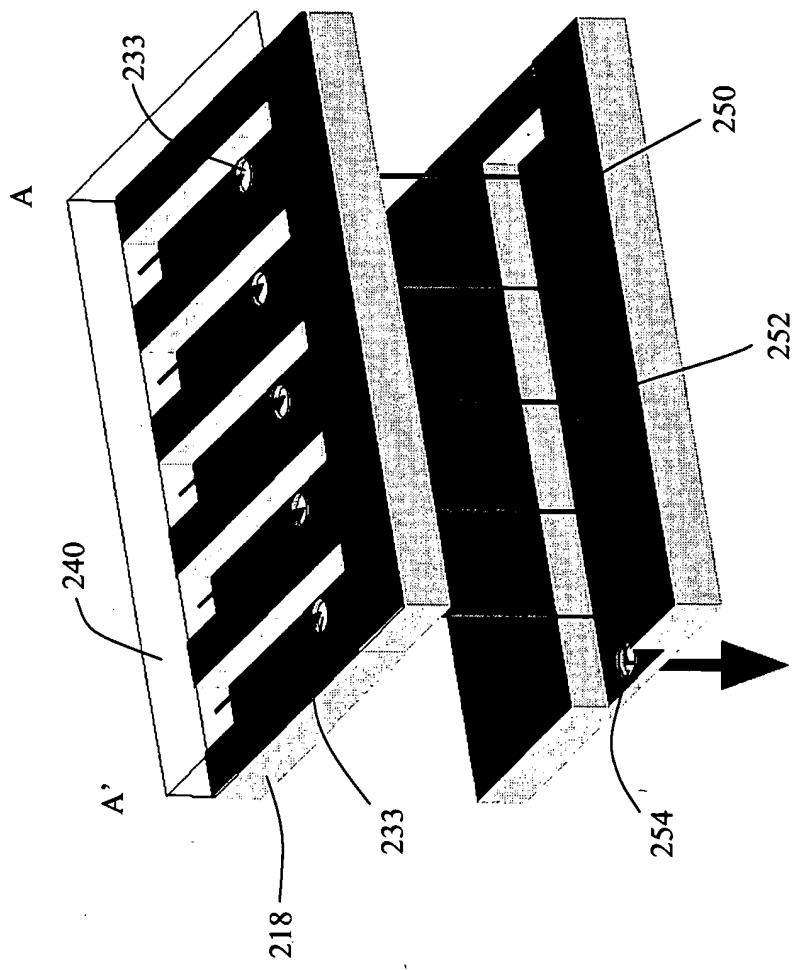


FIGURE 11c

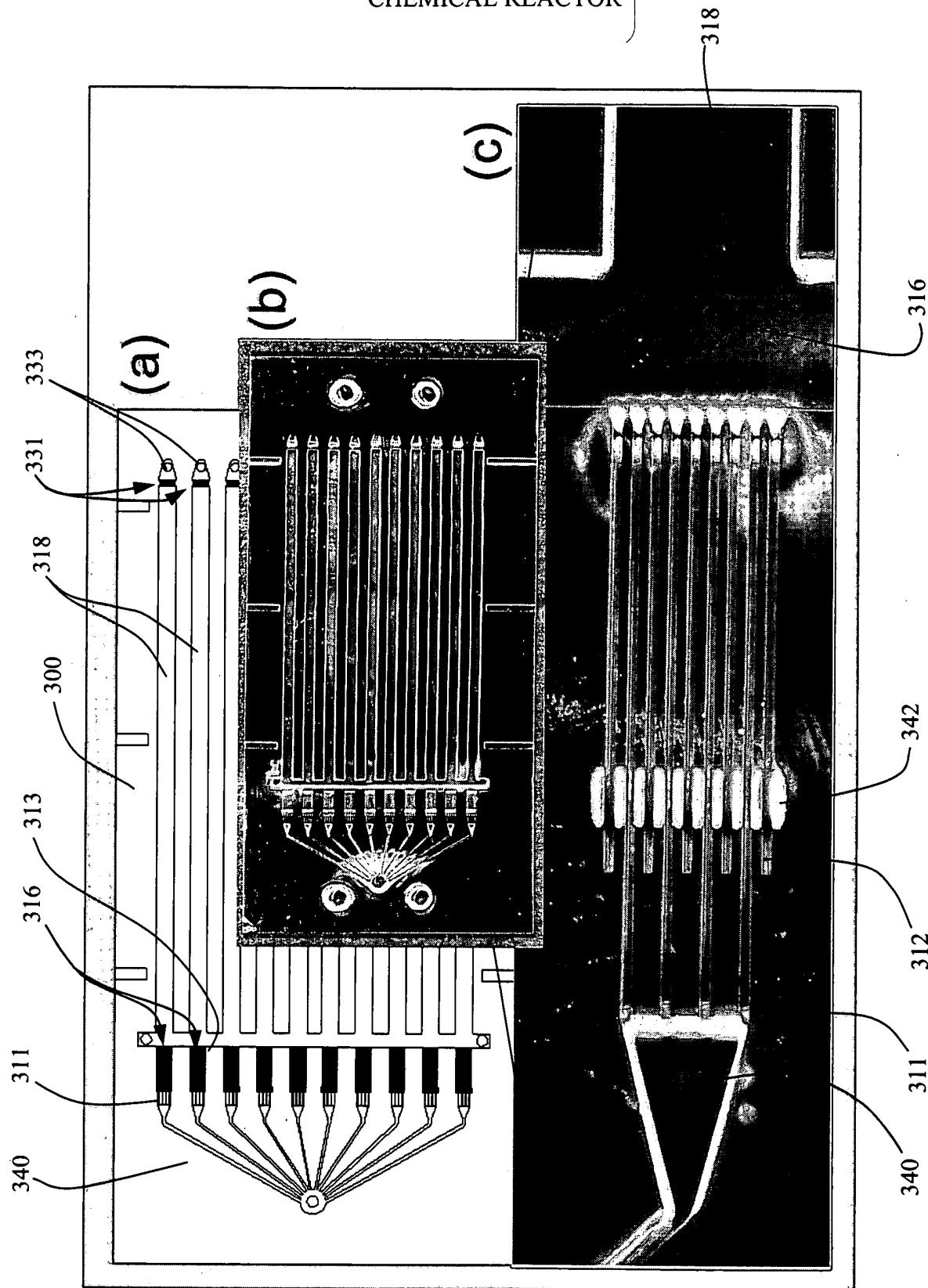


FIGURE 12

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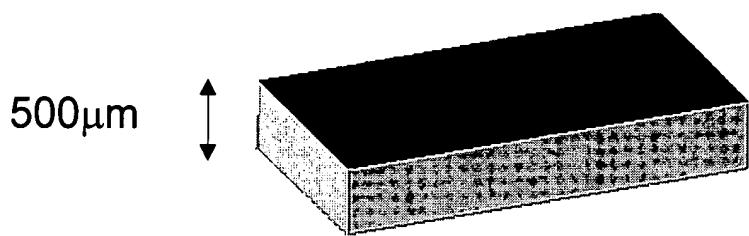


FIGURE 13a

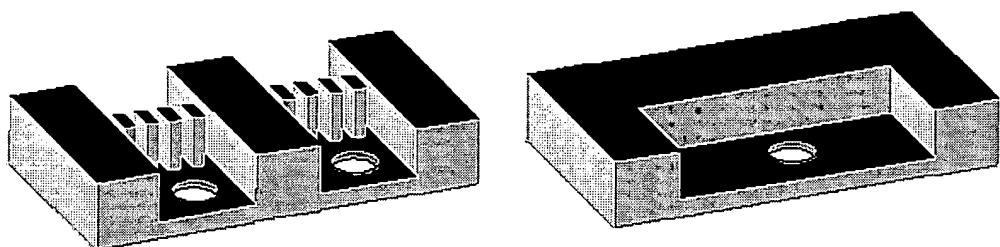


FIGURE 13b

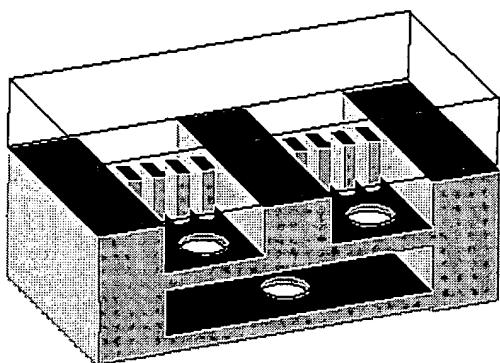


FIGURE 13c

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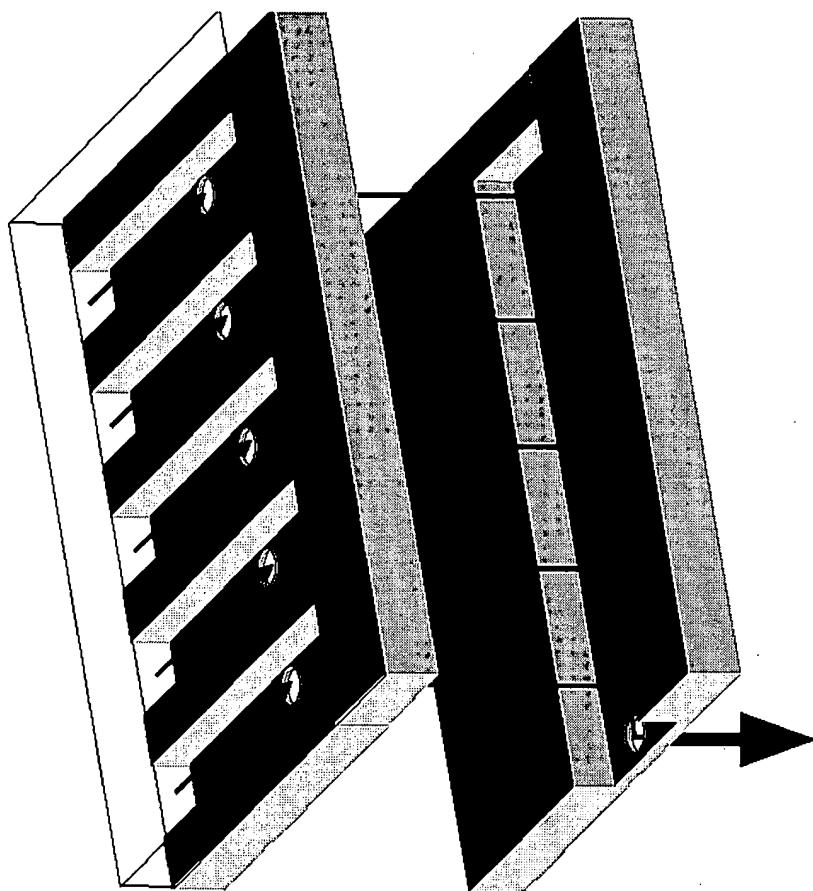
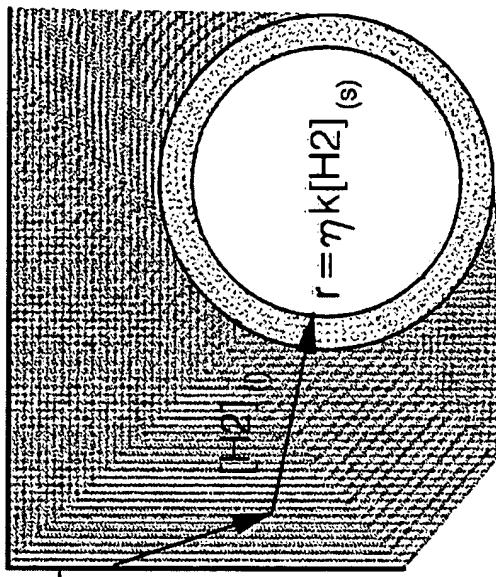


FIGURE 13d

Cyclohexene Hydrogenation



Gas-Liquid Interface,

$$P_{\text{H}_2} \text{ (gas)} = H^* [H_2](l)$$

Gas-Liquid Mass Transfer,

$$r = k_l a_i ([H_2](l) - [H_2](\text{liquid}))$$

Liquid-Solid Mass Transfer,

$$r = k_s a_i ([H_2](\text{liquid}) - [H_2](\text{particle}))$$

FIGURE 14

Multi-channel vs. Single channel reaction rates

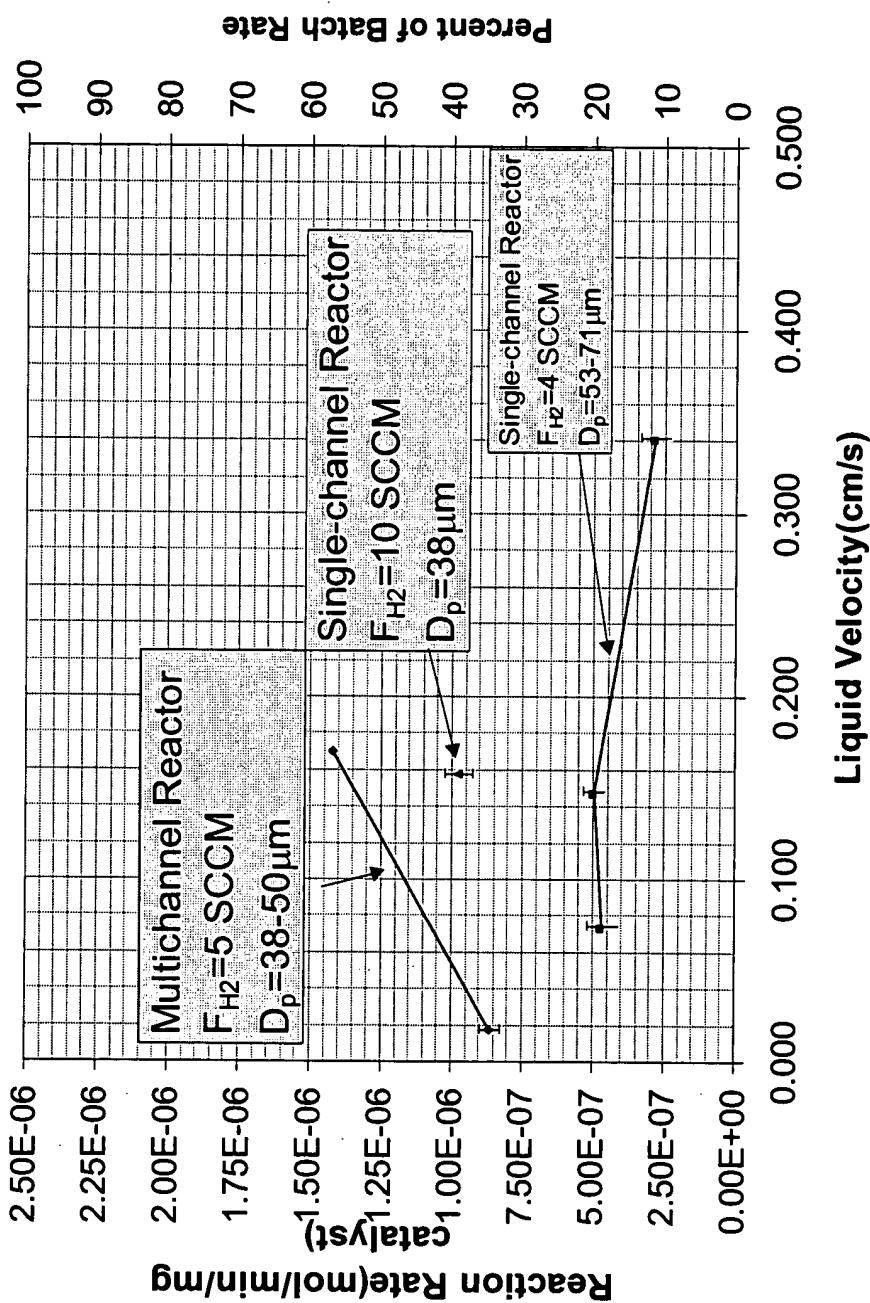


FIGURE 15

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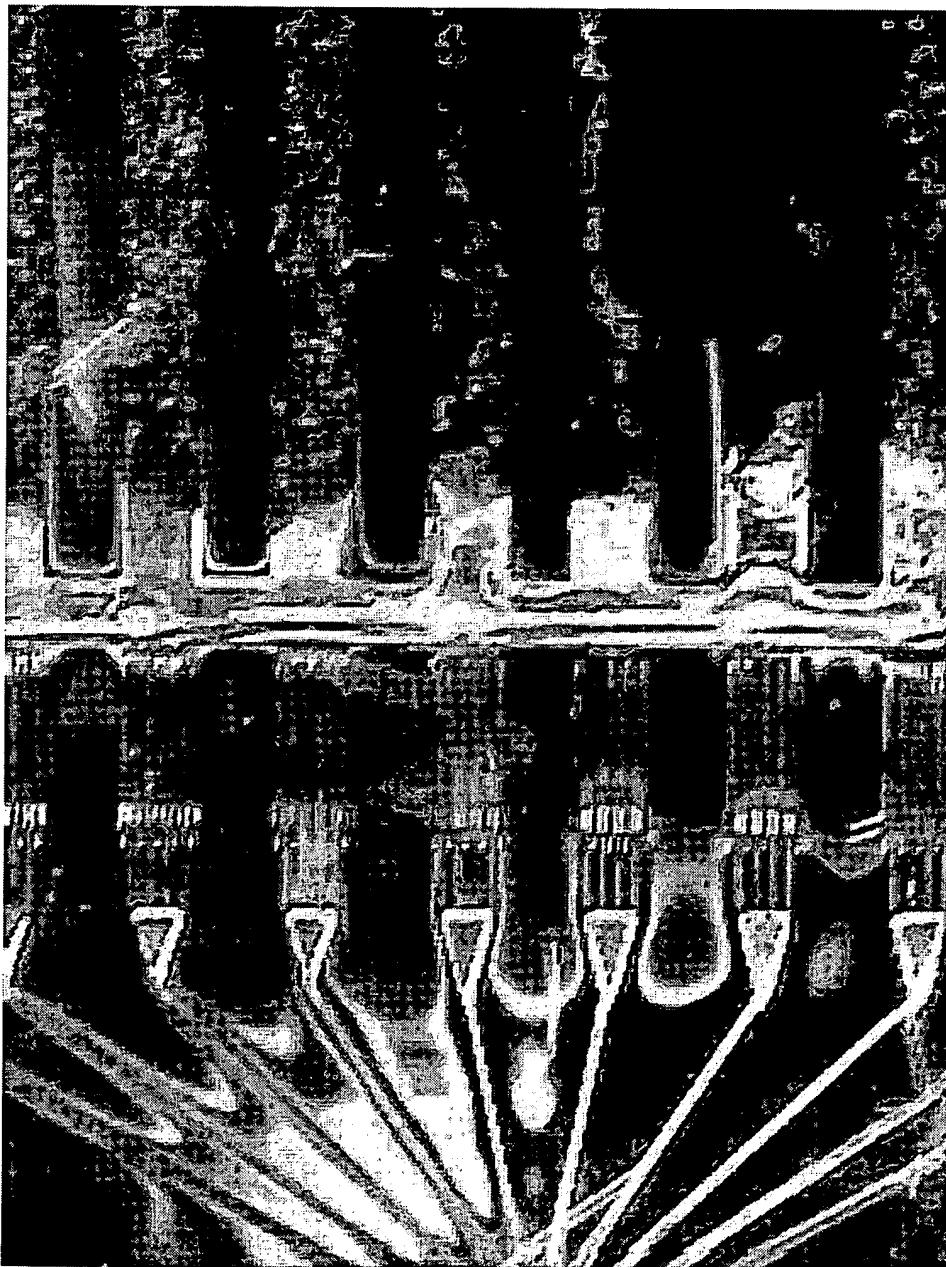


FIGURE 16a

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FIGURE 16b

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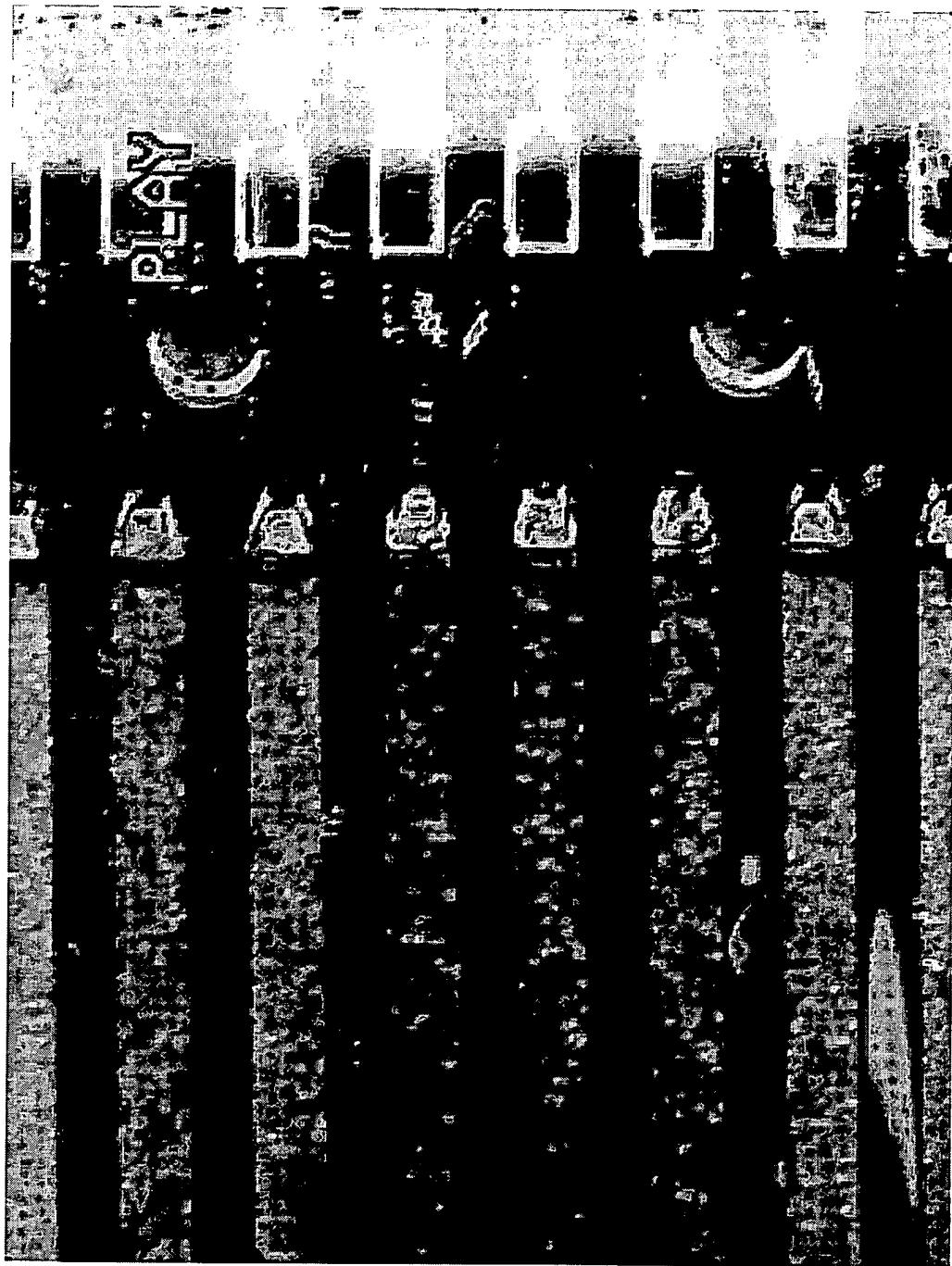


FIGURE 16c

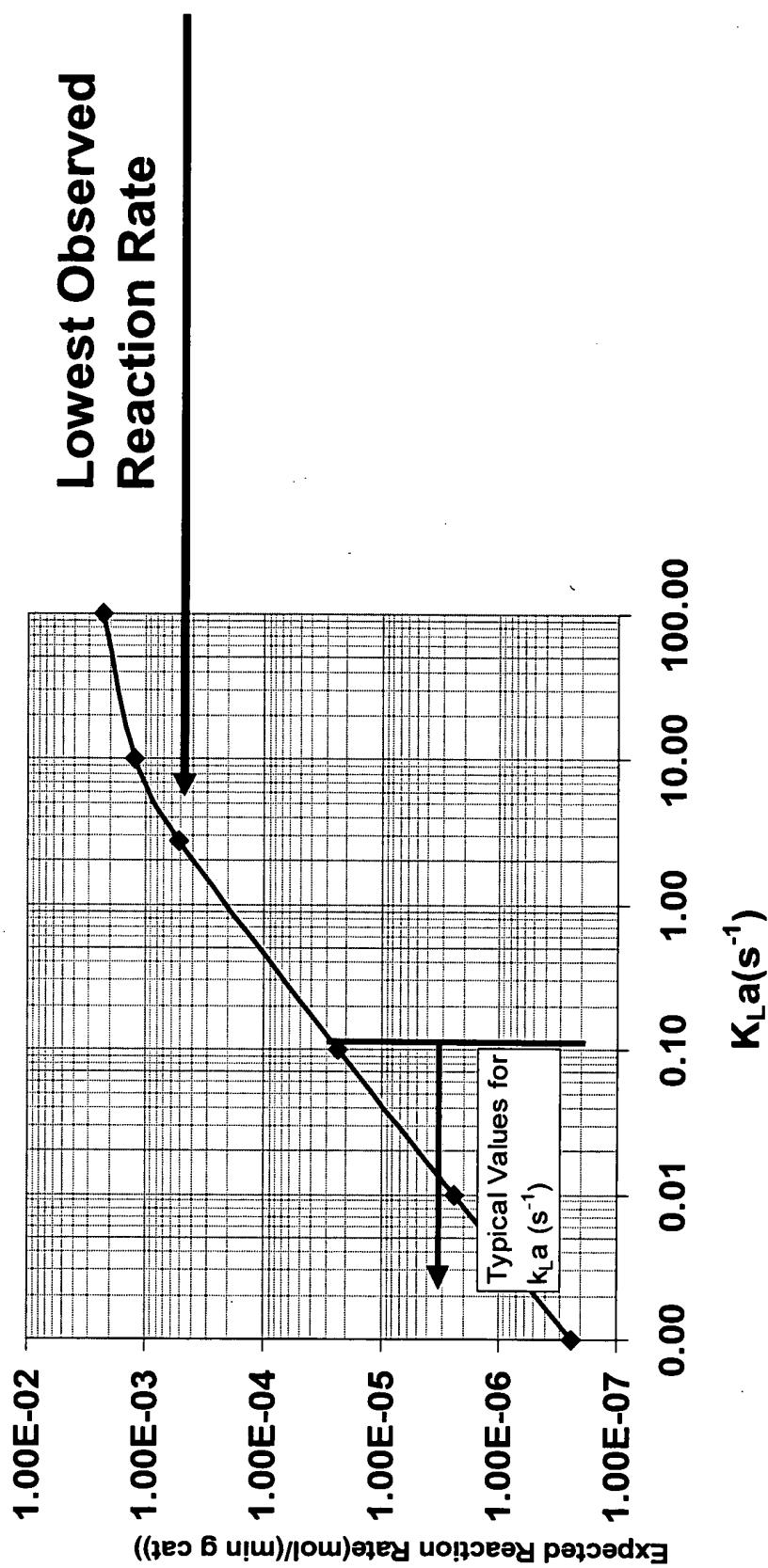


FIGURE 17

$$\frac{\Delta P}{L} \propto \frac{\mu \cdot Q}{D_p^2 \cdot A_s} \cdot \frac{(1-\varepsilon)^2}{\varepsilon^3}$$

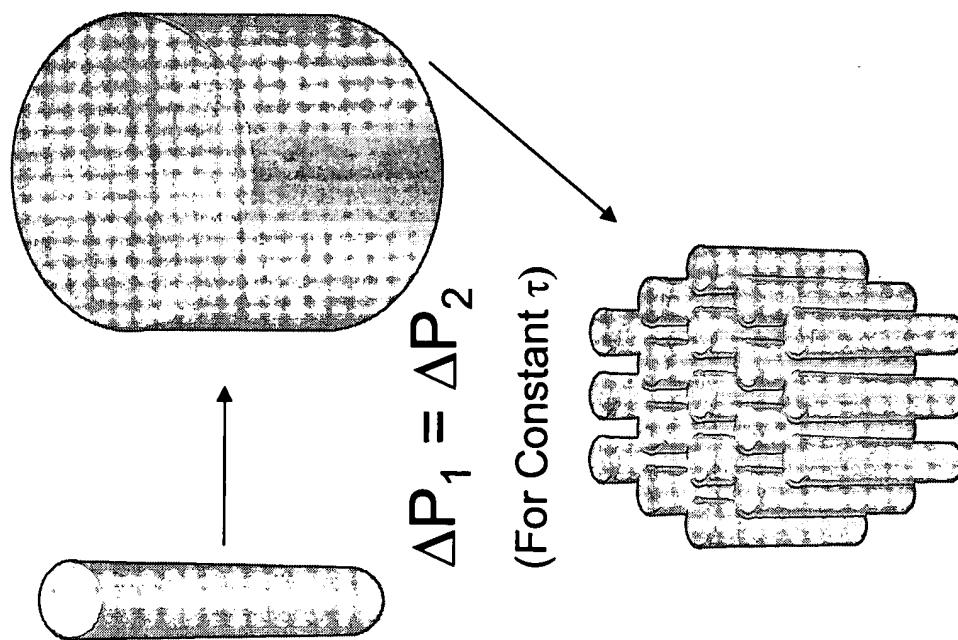
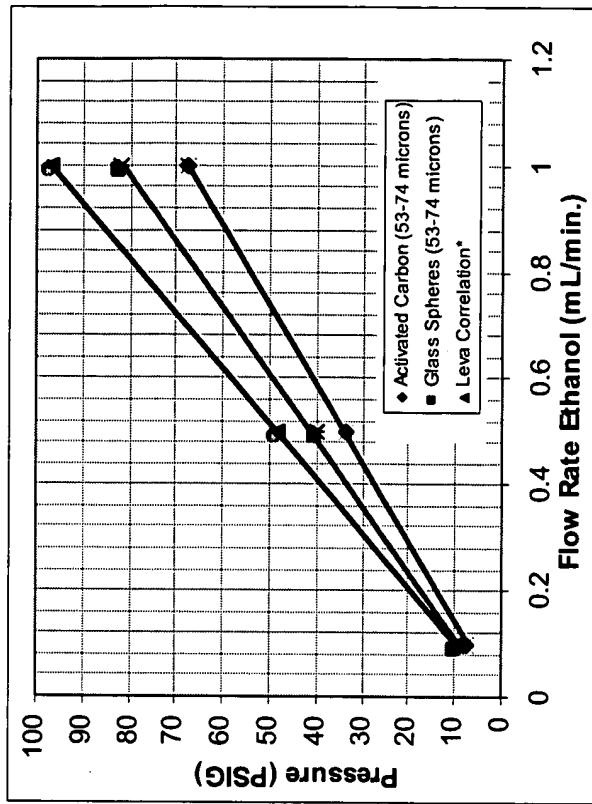


FIGURE 18

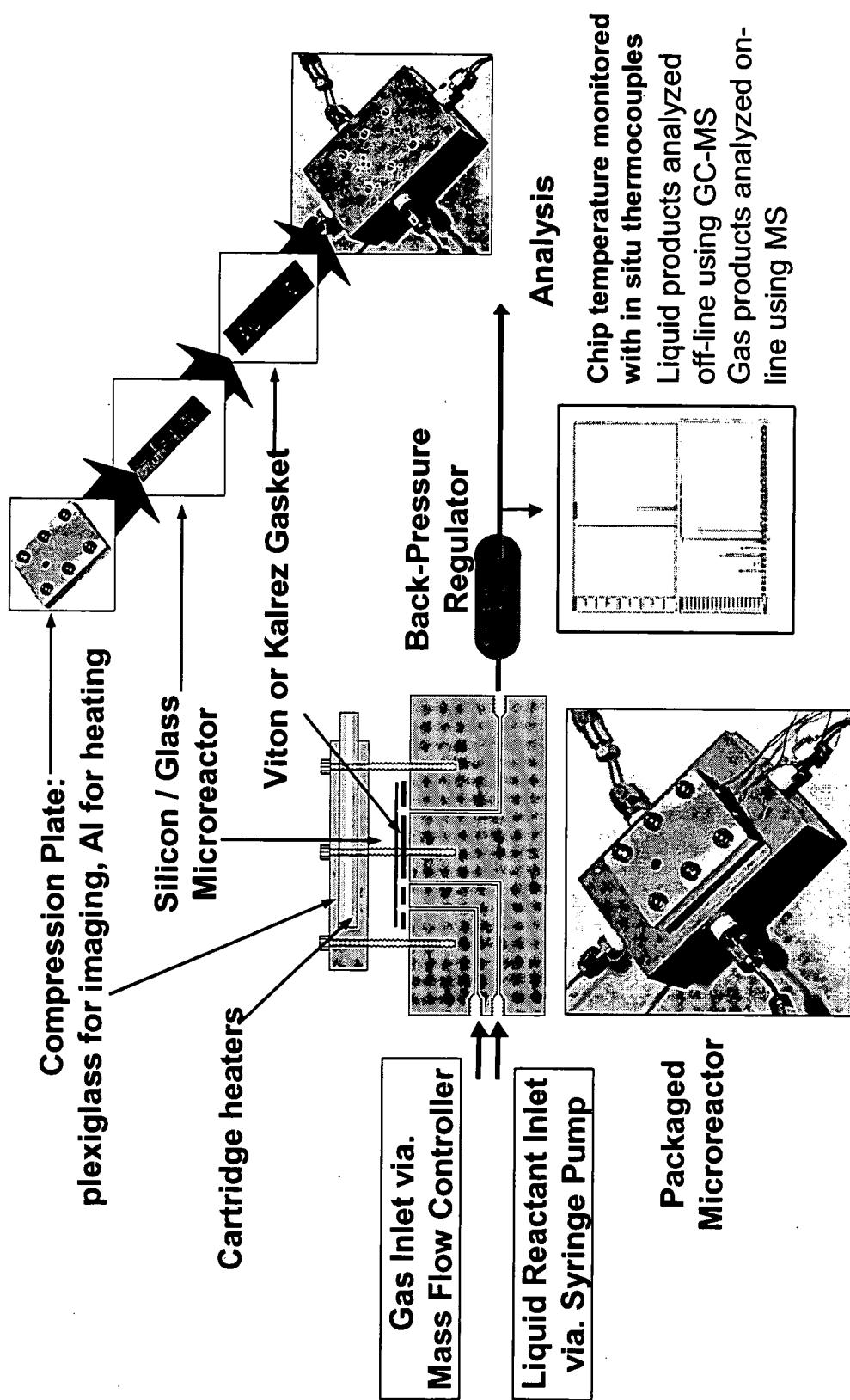


FIGURE 19

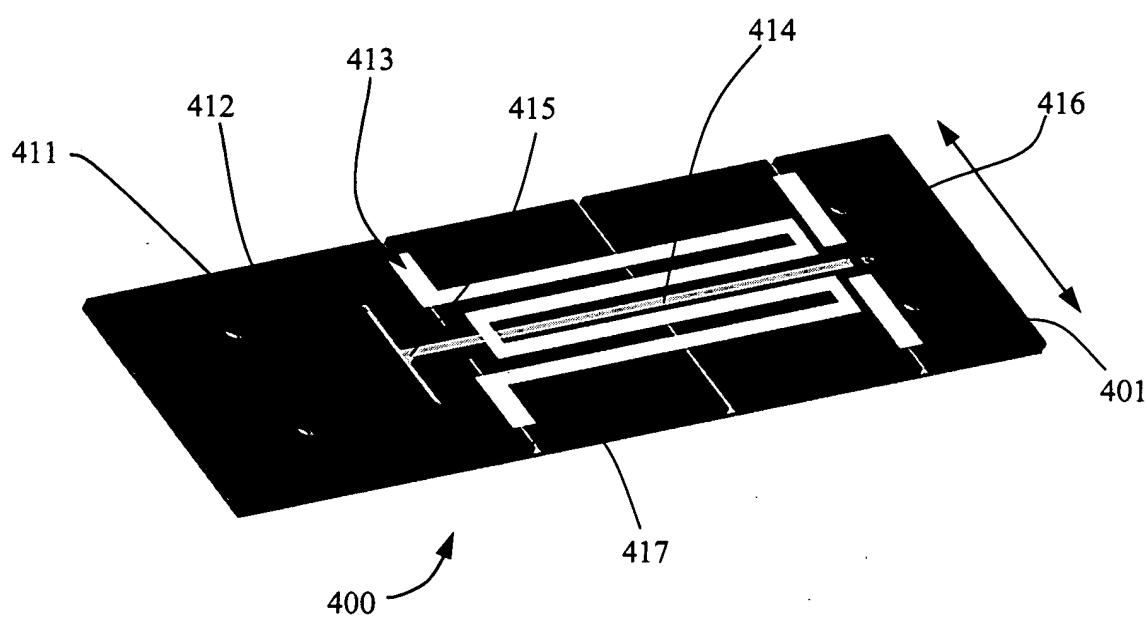


FIGURE 20

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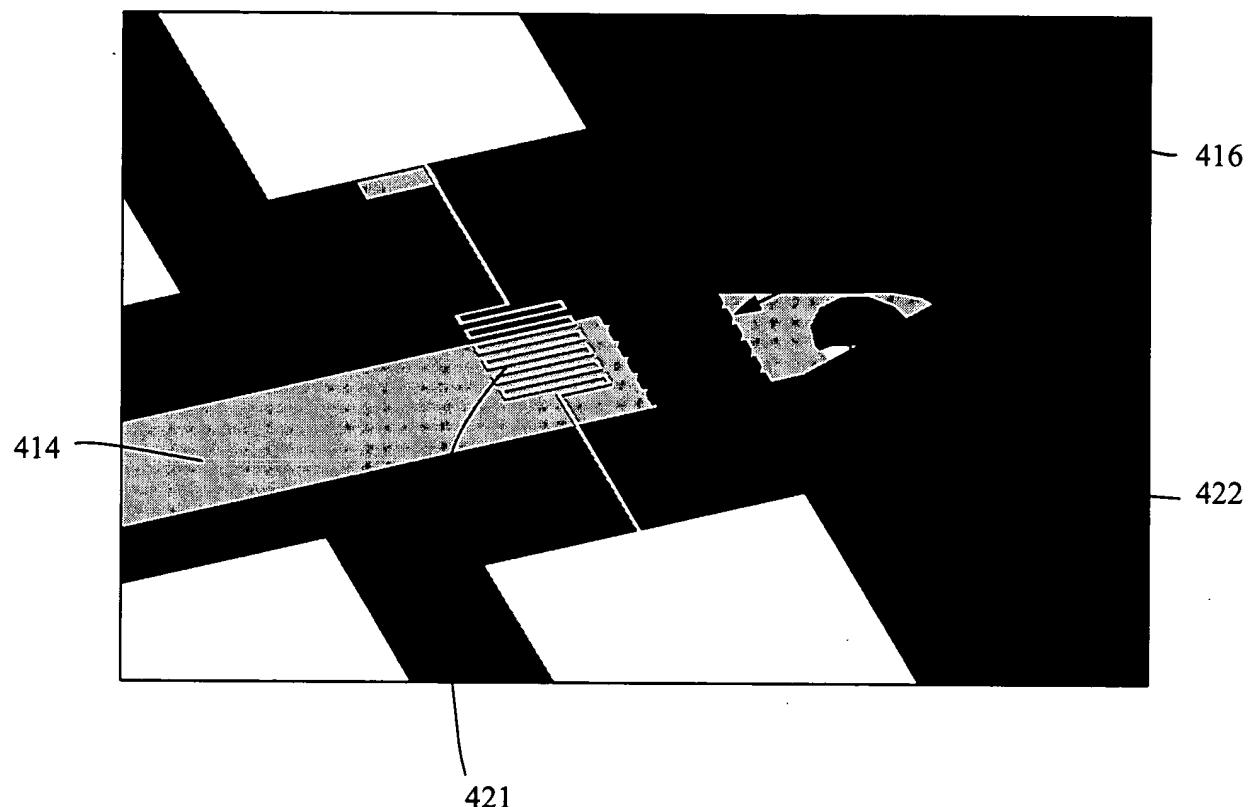


FIGURE 21

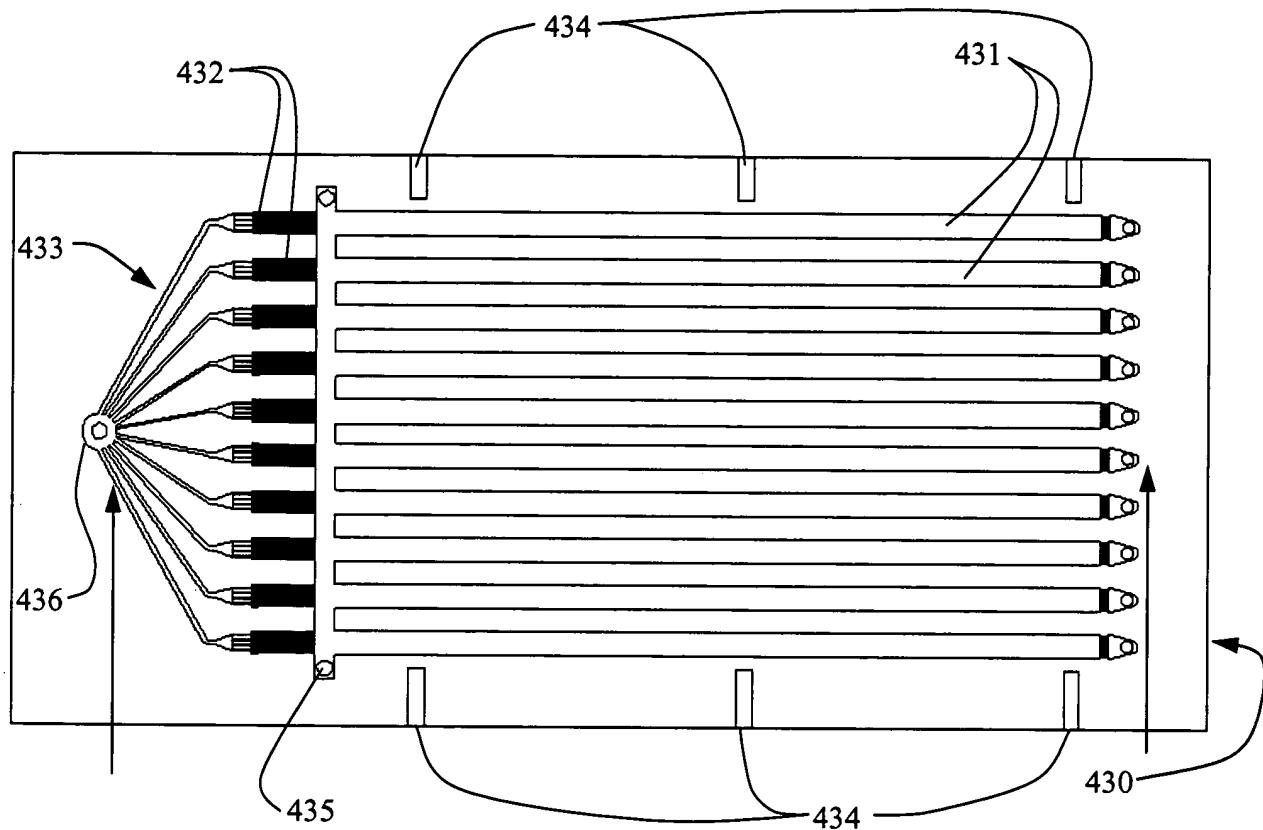


FIGURE 22

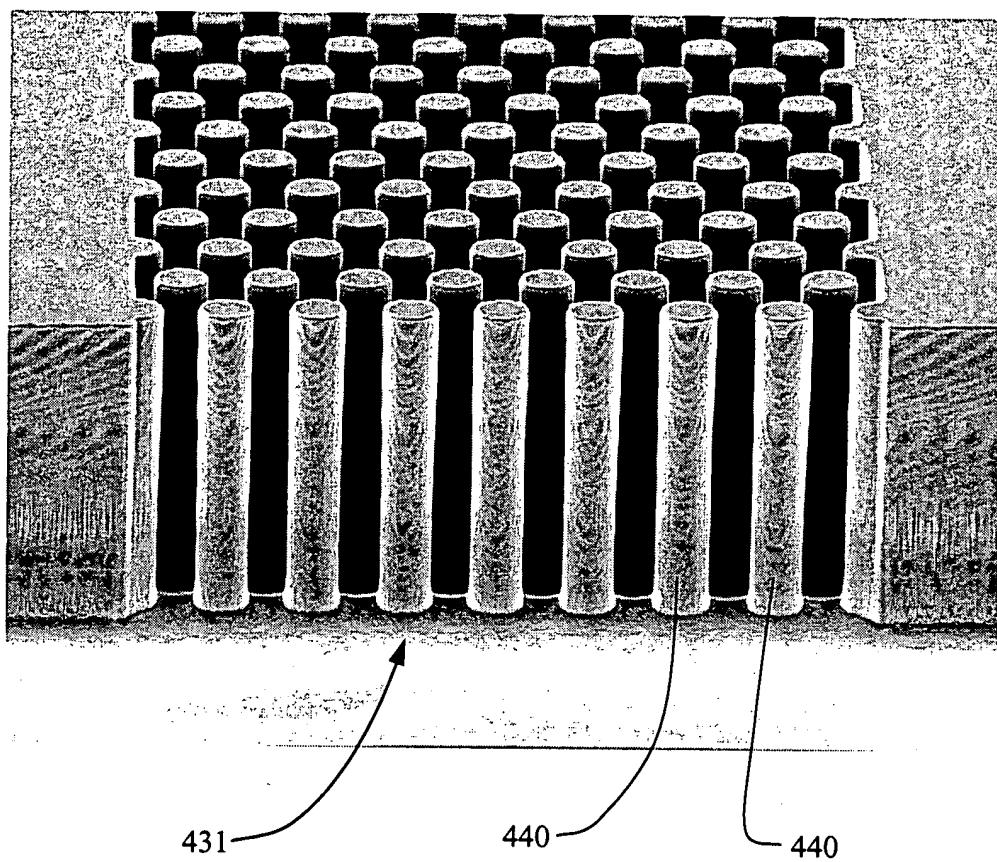


FIGURE 23

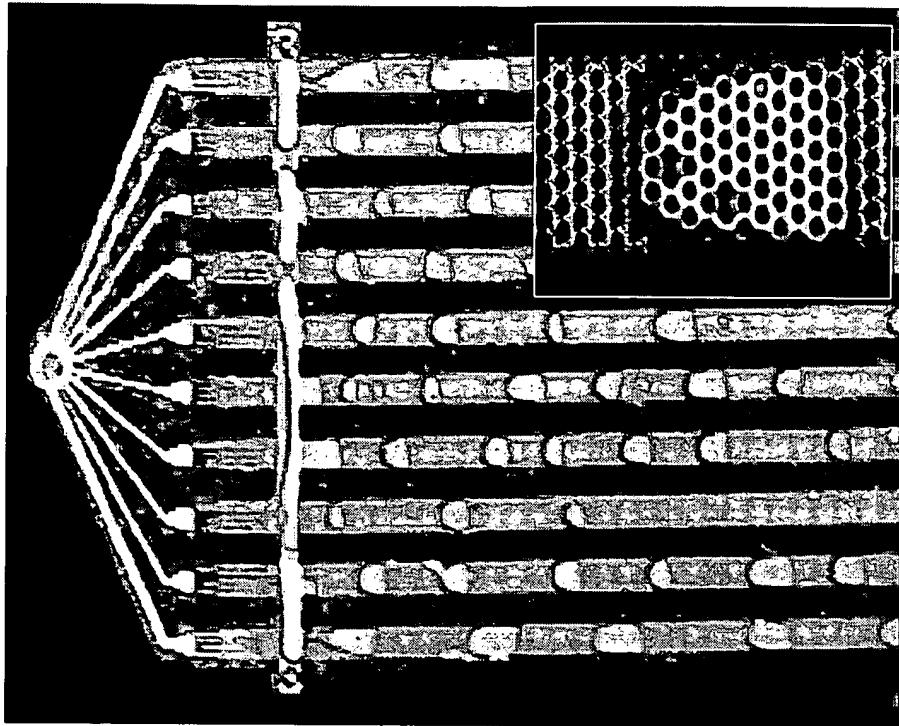


FIGURE 24a

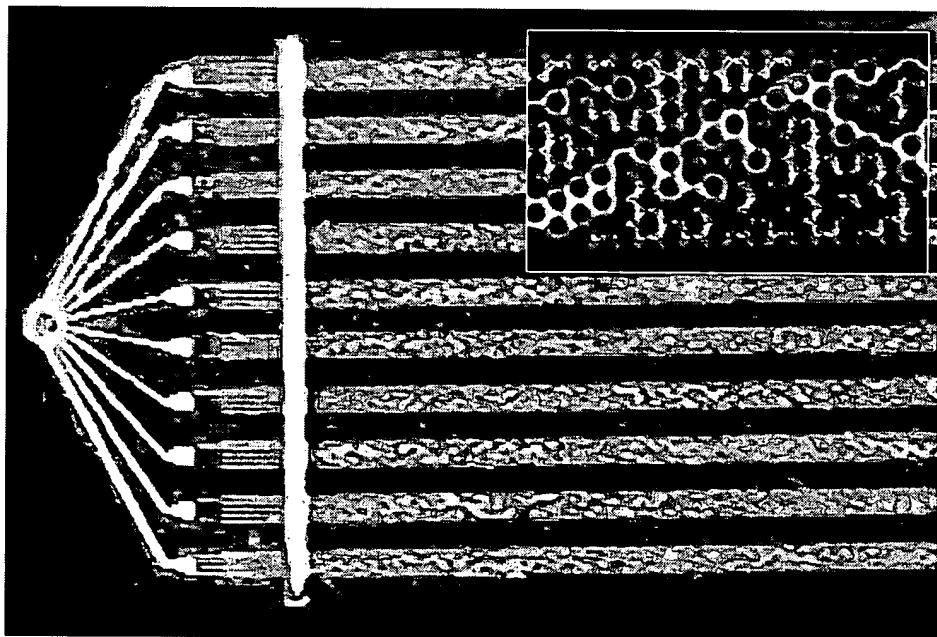


FIGURE 24b

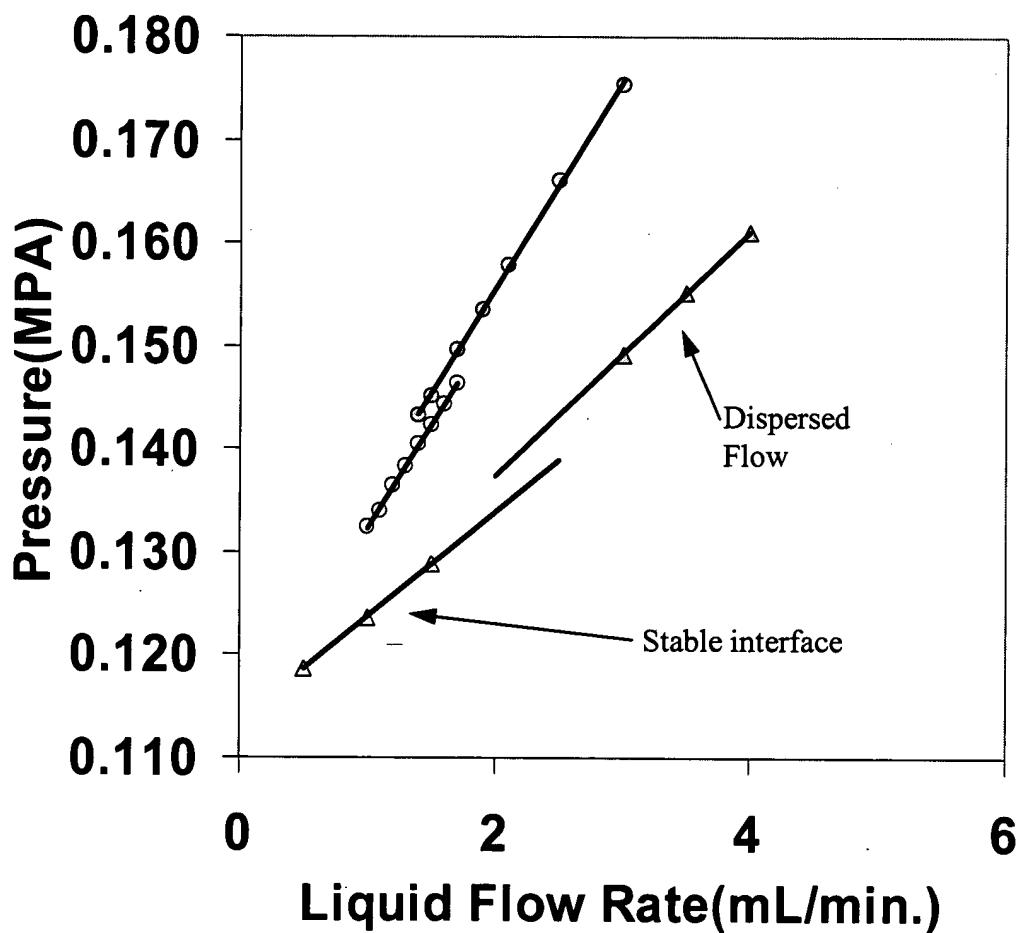


FIGURE 25